SS1/SS4 Signaling Analysis and Emulation
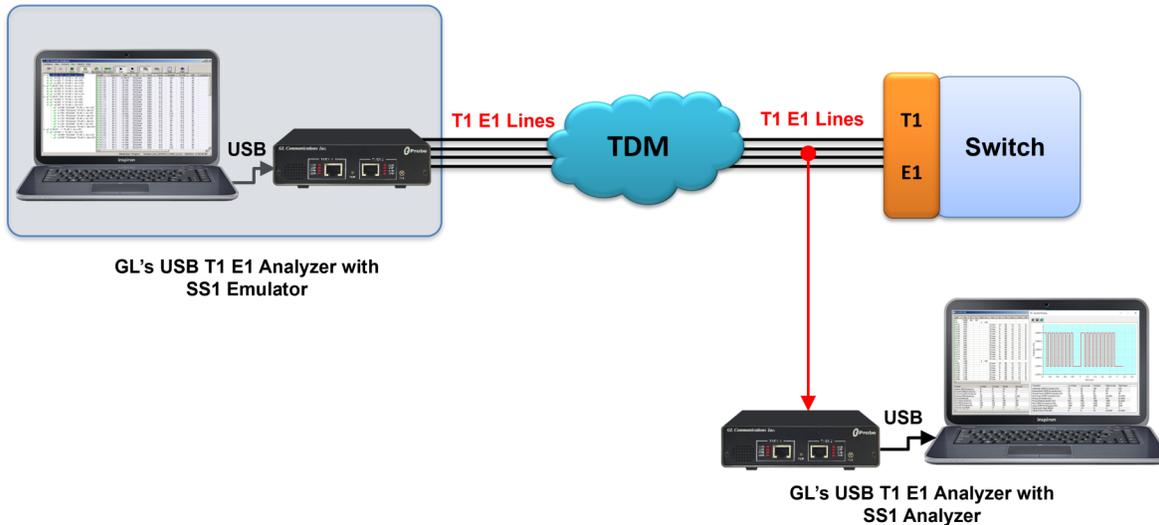

GL's USB T1 E1 Analyzer with SS1 Emulator

GL's USB T1 E1 Analyzer with SS1 Analyzer

Overview

Selective Signaling "SS1/SS4" is a 2 and/or 3 digit dial system used by the Federal Aviation Administration (FAA) within their National Airspace System (NAS) Ground-to-Ground Air Traffic Control Network. It is used on leased and FAA lines between the Air Route Traffic Control Center's (ARTCC), Terminal Radar Approach Control (TRACON), Air Traffic Control Tower's (ATCT), Lockheed Martin Flight Service Hub's "FS-21", Military, National Weather Service and Non-governmental aviation facilities for the control and management of aircraft flights.

The GL's SS1/SS4 Analyzer detects and analyzes tone sequences that make up SS1/SS4 dial digits. Sequences of pulse and guard tones are detected, decoded, and assembled into their corresponding dial digits. The tone sequences are also verified for compliance against a "specification" parameter file which can correspond to published standards or user criteria.

The SS1/SS4 Emulator (Dialer) application provides the ability to setup and dial tone sequences that make up SS1/SS4 dial digits. The applications' interface includes options to setup Dial Code, and control Mask (pulse) and Space (guard) frequencies and duration, Initial, Nominal, and Final Durations, Timeout definitions, Transmit Channel, and other similar parameters related to the dial code.

For more information, please visit Real-time & Remote SS1/SS4 Emulator and Analyzer webpage.

Main Features

- Real-Time and Offline based (File-based) analysis using SS1/SS4 Analyzer
- Dual monitoring capability allowing multiple instances of SS1/SS4 analyzer to simultaneously tap East and West direction traffic.
- Generate and introduce SS1/SS4 dial codes on transmit channels using SS1/SS4 dialer
- Control 'mark' and 'space' frequencies, duration, and power during transmission of SS1/SS4 tones
- Ability to capture either TDM or audio signals
- Analyzer can analyze either 2-digit or 3-digit dial codes.
- Display of received dial codes, including the characteristics of the underlying tones.
- Provides controls to save sets of evaluation criteria, to reinstate previously saved criteria, and to reinstate factory default (industry standard) settings
- Save results to files in a Microsoft® Access and Microsoft® Excel formats
- Allows easy reviewing any number of selected dial code sequences and their underlying tone sequences while ongoing capture and analysis is proceeding
- Operate the SS1/SS4 Analyzer either remotely from the data acquisition site, or on the local PC
- Spectral Graph feature presents a captured dial code as a graphical waveform

SS1/SS4 Analyzer

Real-time Analysis

Using GL's T1 E1 Cards, one can internally capture signal data on a TDM channel or "timeslot". However, GL's T1 E1 Cards also provide VF Input and Output jacks through which you can insert an audio signal onto a designated T1 E1 timeslot.

If the SS1/SS4 signals are being carried on an audio line, route that line into the VF Input associated with the T1 E1 port and then perform analysis.
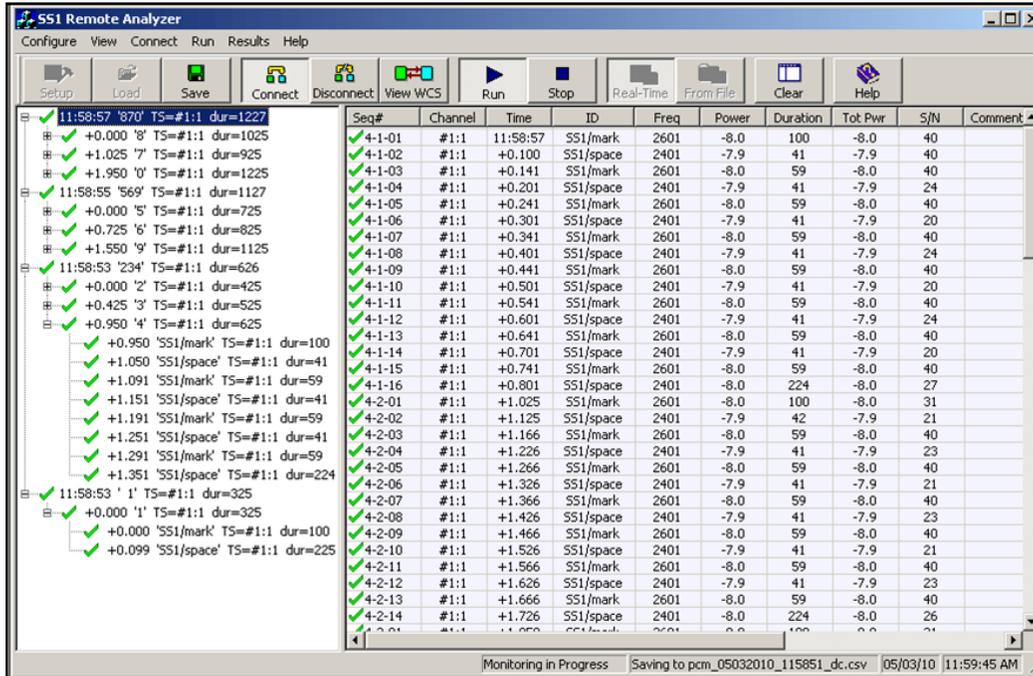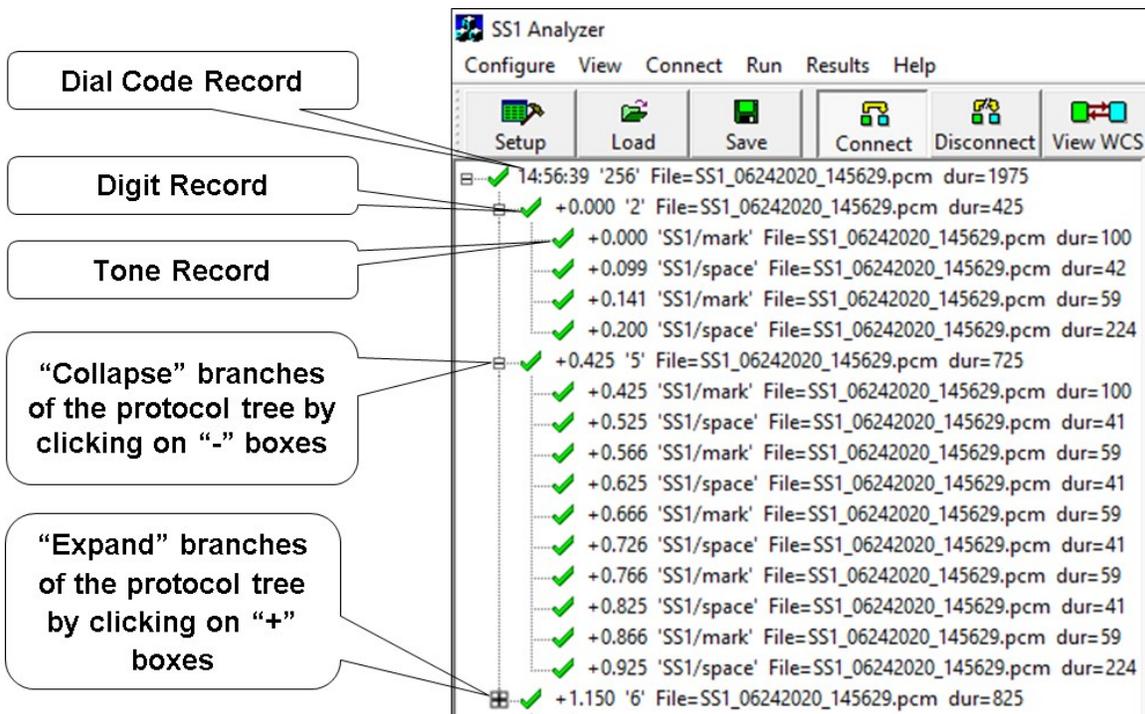

Figure: Analysis Results – Tone View

Figure: Analysis Results – Tree View

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SS1/SS4 Analyzer

Specifying SS1/SS4 Evaluation Parameters

The SS1/SS4 Analyzer implements a wider range of values, which places lower and upper bounds on the FAIL range. Measurements falling outside this range disqualify a signal from being an SS1/SS4 Signaling tone.

The values are organized as follows:

- **Standard**: The standard value of the parameter.
- **Low Accept through High Accept**: Measurements within this range are judged to PASS the evaluation criteria.
- **Low Reject through High Reject**: Measurements within this range but outside the Low Accept to High Accept range are judged to be MARGINAL
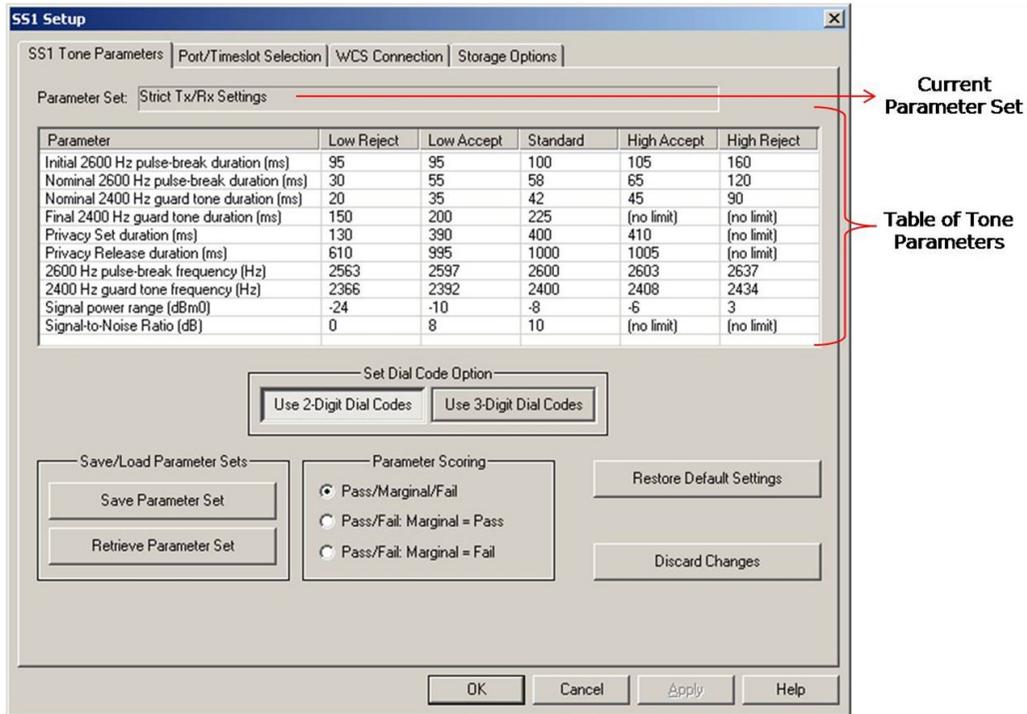
Figure: Evaluation Parameters

Parameter Scoring Options

- Pass/Marginal/Fail option - evaluates tones and their associated digit and dial codes records as PASS, MARGINAL or FAIL.
- Pass/Fail: Marginal=Pass option causes all MARGINAL scores to be reported as Passes.
- Pass/Fail: Marginal=Fail option causes all MARGINAL scores to be reported as FAILures
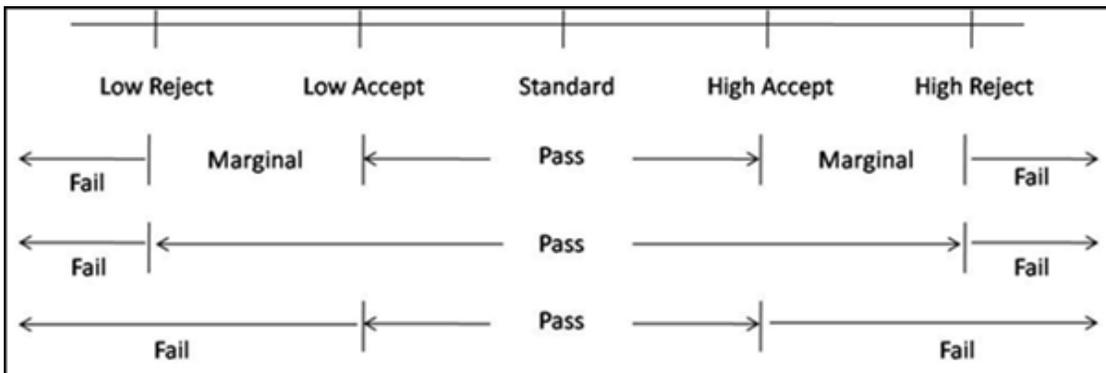
Figure: Parameter Scoring Options

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WCS Connections

SS1/SS4 Protocol Analyzer is a client application and requires connecting to a T1 E1 server. This allows SS1/SS4 analyzer to be used locally or on a remote PC w/o actual T1 E1 hardware installation. Use the WCS Connection options to set all the information required in order to establish a connection with the WCS server and correctly correspond with it.

SS1/SS4 Analyzer and the WCS server connection options -

- Connect to server on This Machine option allows SS1/SS4 Analyzer to run on the Capture PC.
- Connect to server on option allows SS1/SS4 Analyzer to run on a Remote PC
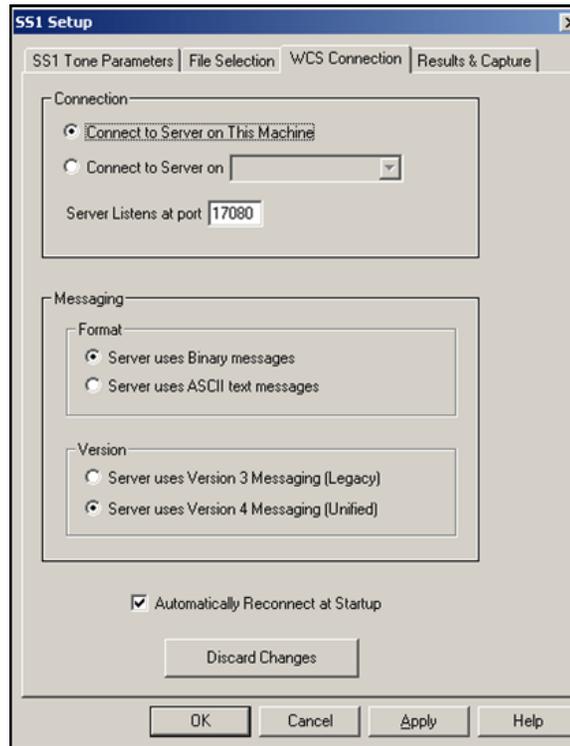
Figure: WCS Connection

File Based Analysis (Offline Analysis)

In Offline analysis, SS1/SS4 analyzer allows users to specify the folder containing the files for SS1/SS4 analysis. File formats supported are a-law, u-law and pcm files.

Analyzes all files in a folder with a given file name extension or analyzes a specific file
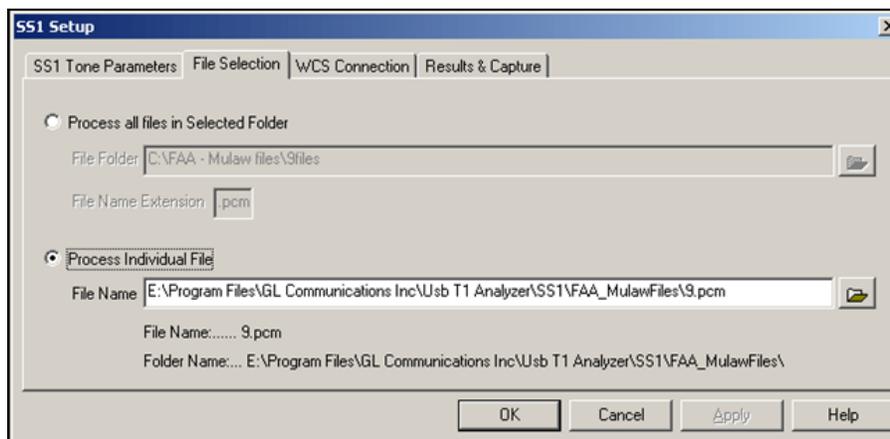
Figure: File Selection

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Storage Options in Analyzer

Currently, only the CSV file format is supported by the SS1/SS4 Analyzer. This format is widely recognized by popular Windows Data Management and analysis tools such as Microsoft® Excel and Microsoft® Access.

Table Name Prefix option allows users to designate a prefix for all files to be saved. The rest of the file name will be made up of a text indicating the date and time of capture, followed by a suffix distinguishing between dial code, digit, and tone records.

Figure: Dial Code and Digit Results in CSV files

Review and Spectral Display for Dial Codes

It is quite likely that you will want to examine a faulty dial code at length or view them as graphical waveform, even as a run is in progress. The SS1/SS4 Analyzer and Dialer provides an independent **Review Dial Code** and **Spectral Display** features for this purpose.

Figure: Review Dial Code and Spectral Display

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Goldwave Capabilities

Mono and stereo (East and West) files that have been recorded can be viewed, heard and analyzed with Goldwave.

Figure: Goldwave Capabilities

SS1/SS4 Emulator ("Dialer")

Overview

The Selective Signaling (SS1/SS4) Dialing Digits (Dialer) application provides the ability to setup and dial tone sequences that make up SS1/SS4 dial digits. The application's interface includes options to setup dial code with control mark and space frequencies and duration, and other parameters related to the digit dialer. Users can create channel for Transmission (Tx), choosing Port and Timeslot.
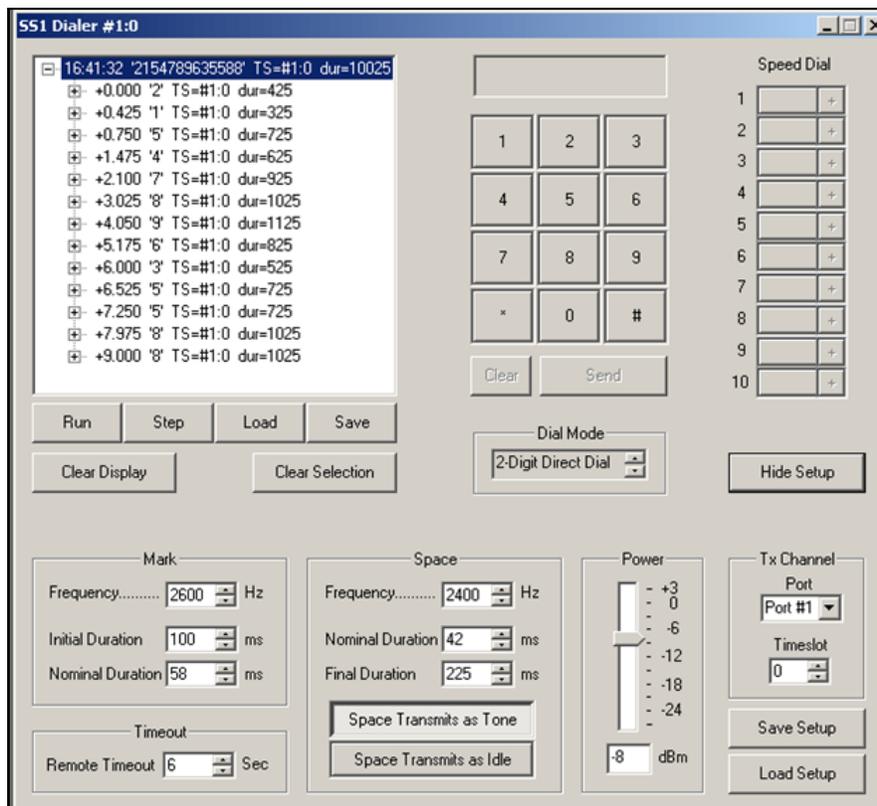

Figure: SS1/SS4 Emulator

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Overview (*Contd..*)

Dial Modes

- Key and Send –All digits are transmitted back-to-back with only the final space tone separating the successive digits in a single burst
- 2-Digit Burst –When the second digit is pressed, the digits are transmitted back-to-back in a single burst. A "1" digit always triggers a transmission, even if it is not the last digit
- 3-Digit Burst – same as 2-Digit Burst Dial, but Dial Code contains three digits. When the third digit is pressed, the digits are transmitted back-to-back in a single burst
- 2-Digit Direct Dial –the Dial Code are sent one-by-one as you key them. When two digits have been keyed and transmitted, the Dial Code is transferred to the Dial History (Display)
- 3-Digit Direct Dial – same as 2-Digit Direct Dial, but Dial Code contains three digits. When three digits have been keyed and transmitted, the digit record is transferred to the dial code display

Dialing

- Dialing option is used to set up Dial Code sequence
- This is a transmit application is crucial for SS1/SS4 signal emulation
- The dialed codes are transmitted via the Tx channel created
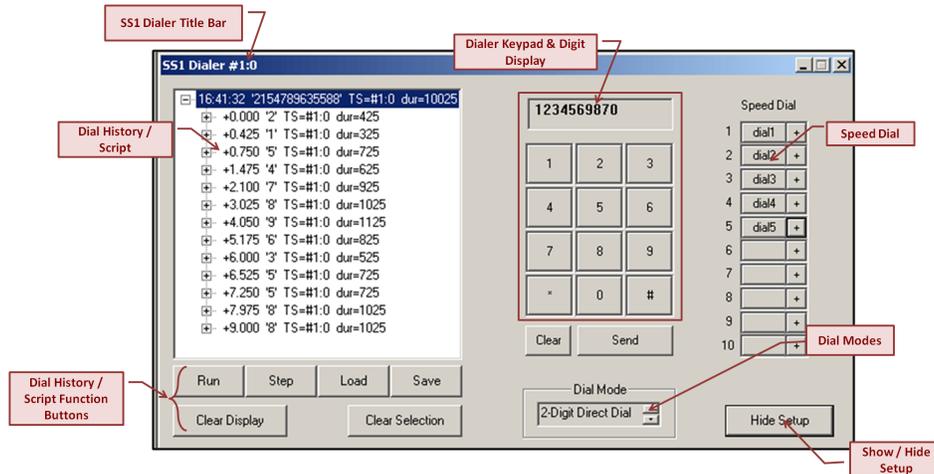- Supports **Review Dial Code** and **Spectral display** features

Figure: Dialing

SS1/SS4 Dialer Setup

- Set up Pulse-Break (mark) and Guard Tone (space) frequencies, duration, power, and other parameters to form SS1/SS4 digits
- Spaces can be transmitted either as guard tones or quiet intervals
- Transmit on either digital time slots (channels) or via VF Audio
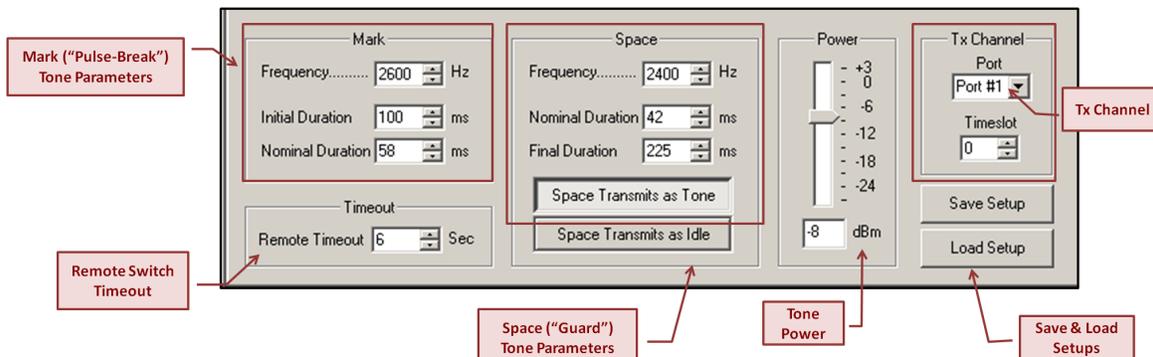- Digit timeout imposed in direct dial modes

Figure: Dialer Setup

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Buyer's Guide

Item No	Product Description
XX626	SS1/SS4 Signaling Emulator and Analyzer

Item No	Related Software
XX605	Dual VF Tx Rx
SA048	Goldwave Software

Item No	Related Hardware
PTE001	tProbe™ Dual T1 E1 Laptop Analyzer (Require Basic Software)
FTE001	QuadXpress T1 E1 Main Board (Quad Port)
ETE001	OctalXpress T1 E1 Daughter boards (Octal Port)
XTE001	Dual Express (PCIe) T1 E1 Boards
TTE001	tScan16™ T1 E1 Boards

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more information, please visit Real-time & Remote SS1/SS4 Emulator and Analyzer webpage.